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Editorial

Closing the Gap between Physical and Electronic Trading

Michael König

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In the late 1970s, the term "electronic trading" was almost exclusively associated with stock exchanges since they were the first to implement such trading platforms. Off course, at the time, these platforms offered rarely more than a glimpse of what they would evolve to in the decades to follow. Today, buying or selling stocks and other securities is hardly imaginable without the aid of fully automated trading platforms: Cutting-edge electronic trading systems connect market participants worldwide, facilitating transparent price discovery within nanoseconds. One asset class, however, needed significantly more time to adopt electronic trading, and still does in some respects: commodities. The New York Mercantile Exchange, for example, abandoned floor trading of commodities no earlier than 2017, and while electronic trading witnessed a notable upturn in the commodities sector lately, only few products are traded fully electronically, as it is the case with stocks or bonds. Most commodities

transactions are completed via a hybrid model, using both electronic trading systems and the traditional voice broker space. Moreover, many commodity markets are still so-called inter-dealer markets, neither offering equal access for all market participants, nor access for private investors at all, but relatively high transaction cost. The reason that commodity trading has taken so much longer to get fully automated than securities lies in the issue of physical delivery and the physical hedging following the transactions, respectively. Think crude oil, wheat, coffee beans, or steel.

However, there is one commodity that always has stood out: gold. This precious metal plays a dual role: one as an essential industrial commodity and another as the hardest currency in the history of mankind. It is no coincidence that in times of financial market turmoil and geopolitical uncertainties, gold has been a proven safe haven time and again. Therefore, gold has

always been a special case when it comes to trading, and has served as a forerunner in electronic commodity trading.

With the introduction of Exchange-Traded Funds (ETFs) some 25 years ago, the ground for a more flexible and cost-efficient way to trade gold was laid. While ETFs initially were designed as investment funds passively tracking the price movements of a given stock index, soon new indexes were created to allow investors to pursue more refined trading strategies. In early 2003, the worldwide first gold ETF was listed on the Australian Securities Exchange, enabling market participants to track the spot price of gold without having to purchase a single ounce of the precious metal. To ensure holders of the gold ETF that their investments were safe, the fund was hedged with physical gold. Gold-backed ETFs have proven very popular right from the start with instructional and private investors alike,

facilitating highly liquid trading with spreads tighter than ever deemed possible in gold trading. As a consequence, gold – traditionally a long-term investment – has become of interest for a total different class of investors, from hedge fund managers to day traders.

In Germany, neither private nor institutional investors are allowed to invest in gold ETFs due to the German adaptation of the EU-wide UCITS (Undertakings for Collective Investments in Transferable Securities) directive. To solve this problem, the Exchange-Traded Commodity (ETC) Xetra-Gold was introduced in 2007 – a fully gold-backed bearer bond that certifies every buyer the right to demand delivery of one gram of physical gold for every Xetra-Gold bearer note they own. Thus, the gap between electronic and physical gold trading – from automated price discovery to physical delivery – has been closed for good. Today, Xetra-Gold is the most popular ETC in Europe.

Research Report

Estimating Network Effects in Two-Sided Markets

THE PROLIFERATION OF THE INTERNET HAS ENABLED PLATFORM INTERMEDIARIES TO CREATE TWO-SIDED MARKETS IN MANY INDUSTRIES. IN SUCH MARKETS, NETWORK EFFECTS OFTEN OCCUR WHICH CAN DIFFER FOR NEW AND EXISTING CUSTOMERS. THE AUTHORS DEVELOP AN INFLUX-OUTFLOW MODEL TO INVESTIGATE THE CONDITIONS UNDER WHICH THE ESTIMATION OF SAME-SIDE AND CROSS-SIDE NETWORK EFFECTS SHOULD DISTINGUISH BETWEEN ITS IMPACT ON THE NUMBER OF NEW CUSTOMERS (I.E., ACQUISITION) AND EXISTING CUSTOMERS (I.E., THEIR ACTIVITY).

Oliver Hinz

Thomas Otter

Bernd Skiera

Motivation

Due to widespread use of the Internet, the growth of the "Network Economy" has resulted in a rise of two-sided markets. Such markets allow for interactions between two distinct customer populations like buyers and sellers (e.g., Amazon) or employees and employers (e.g., Monster.com). Typically, two-sided markets facilitate different kinds of network effects: Cross-side network effects describe the situation whereby the presence of many sellers attracts more buyers to the market (e.g., eBay) and vice versa (Tucker and Zhang 2010). In contrast, same-side network effects capture the interplay within one customer population. Same-side and cross-side effects can some-

times go in different directions: For example, more buyers make an auction platform less attractive for buyers because of the heightened competition, but more attractive for sellers because of the increase in demand.

Companies typically have access to data – in particular, time-series data – on the development of the number of customers on the two market sides, which can help them estimate the direction and magnitude of network effects. Such knowledge can support growth predictions, as well as the IT and marketing investment decisions that follow. Yet, measuring network effects remains a troublesome task, and the literature to date has examined – at best – $2 \times 2 = 4$ kinds of

network effects – that is, a same-side and a cross-side network effect for each of the two market sides. However, network effects arise from a variety of mechanisms. For example, on the one hand, a larger number of customers can lead to a wider range of offerings or more word-of-mouth within and across both market sides, which can increase the attractiveness of the market. On the other hand, the same situation can also lead to a decrease in attractiveness because of stronger competition among customers on one market side. Furthermore, such effects can differ for new and existing customers. For example, word-of-mouth generated by existing customers (hereafter called the installed base) might affect the acquisition of new customers more strongly than the activity of existing customers. As another example, disclosing a large number of buyers on an auction platform might attract new buyers because such a large number serves as an indicator of the attractiveness of the market, but existing buyers might churn because of the expected increase in competition that results from a higher number of buyers.

The research to date has mainly investigated the sum of these two effects by assessing the net change in the number of customers on one side of the market. Thus, instead of examining changes in the number of newly acquired customers and the number of churning customers separately, they simply examine the sum of both, that is, the change in the number of total customers. More technically speaking, the market grows on both sides because of an influx (which constitutes the number of new

customers) and shrinks because of an outflow (which constitutes the dropout, or churn, of existing customers) (Haenlein, 2013). However, investments in IT can have asymmetric effects on influx and outflow; thus, jointly estimating them may inaccurately summarize both effects because the growth in the number of new and existing customers may differ across time. Yet, it is important to have knowledge of the separate effects because organizations usually assign different units to acquire and retain customers on the two market sides (Blattberg and Deighton, 1996).

Therefore, we develop a new model, the influx-outflow model, which allows for asymmetric network effects; that is, dropout and acquisition present different effects on each market side. This model is unique because it is the first to conceptually and empirically estimate eight network effects (two kinds of same-side network effects, two kinds of cross-side network effects, and two kinds of effects on influx and outflow).

Simulation Study

To test our theoretical considerations, we implemented a large-scaled simulation in C# and R. To this end, we created 84,672 markets by systematically varying the strength of the different network effects and the error level. We assume that a decision maker or data scientist uses weekly data from the past year (from T-52 to T) to calibrate both the net change and the influx-outflow models, with the aim of forecasting the development of the installed base (i.e., the number of customers on both market sides)

over the next 52 weeks (from T to T+52). We then compared the models' performance. Specifically, we estimated all four equations (i.e., the effect on the influx of buyers and sellers as well as the outflow) simultaneously, using seemingly unrelated regressions (SUR) with maximum-likelihood estimation while correcting for both heteroskedasticity (using robust standard errors) and autocorrelation. The results demonstrate that the influx-outflow model leads to better predictions, on average, than the net change model. The average values of the mean absolute percentage error (MAPE) are 38.6% better for the buyer and 95.6% better for the seller side. We also compared the predictions in each of the 84,672 markets.

Illustrative Empirical Study

Furthermore, we conducted an illustrative empirical study using the data on all 102,096 transactions completed between buyers and sellers on an intermediary platform over a time period of more than four years. We used weekly data (covering 211 weeks) as the unit of analysis. Our proposed model requires determining the number of (existing) buyers and sellers, the number of new buyers and sellers (i.e., influx), and the number of lost buyers and sellers (i.e., outflow).

We observed a positive cross-side network effect of +6.374 (p < .01) from the number of sellers on the number of new buyers, which means that more sellers make the platform more attractive for new buyers. More precisely, an additional seller in t-1 led to the weekly acquisition of six additional buyers. Furthermore, the results revealed a negative same-side network effect

of -.021 (p < .05) from the number of buyers on new buyers, in accordance with theory.

For the second dependent variable, the outflow of buyers, we observed that an increase in the number of buyers increased the outflow of buyers (+.002, p < .05). This network effect can stem from a high level of competition among buyers. On the seller side, the number of sellers decreased the number of acquired sellers (-0.062, p < .05). Furthermore, the number of buyers had no significant effect on the acquisition of new sellers (p > .1). This result indicates that, in this early phase of a startup, sellers are more persuaded by other factors when deciding to try out this new platform, and thus, management is justified in first focusing on the acquisition of sellers. We also show that a higher number of sellers increased the outflow of sellers (+.169, p < .01) and more buyers decreased the outflow of sellers (-0.002, p < .01).

The data set also allowed us to evaluate the effect of different investments into the platform's functionality, which could unearth valuable insights for other companies that aim to grow a two-sided market in the B2C domain. The "Trusted Shop" seal functionality improvement significantly simplifies the acquisition of buyers (+406.761, p < .01) and sellers (+2.876, p < .05). Moreover, the seal also decreases the likelihood of losing sellers (-3.375, p < .01). Presenting information and technical details for recently launched products were appreciated by both new buyers and new sellers because it increases the acquisition of both buyers (+375.284, p < .01) and sellers (+1.427, p < .05).

And, by incorporating user feedback, new sellers were also attracted (+3.941, p < .01). In sum, it appears that investments in trust made the largest contribution to market growth.

Conclusion

In this article (Hinz et al., 2020), we propose a model that not only distinguishes between cross-side and same-side network effects, but also allows for network effects that can have an asymmetric impact on the acquisition of new customers and the outflow of existing customers. Our findings show that network effects can have an impact on the interrelated growth process of the two customer populations. We find that the installed base of sellers positively influences the acquisition of buyers (positive cross-side network effect), but negatively influences the acquisition and activity of sellers (negative same-side network effects). Meanwhile, the installed base of buyers decreases the outflow of sellers (positive cross-side network effect), but negatively influences the activity and acquisition of buyers, potentially due to greater competition (negative same-side network effect).

Methodologically, we showed that separately modeling the influx of new customers and the outflow of existing customers on each market side produces more reliable statistical inferences, on average, than modeling the net changes in the numbers of buyers and sellers.

Our results suggest that it is especially preferable to employ the influx-outflow model in two-sided markets if one expects a positive (negative) same-side network effect on acquisition,

but a negative (positive) same-side network effect on the activity of that market side. In contrast, the net change model is preferable for markets in which the installed base of the same side positively influences both acquisition and activity of the same side. The paper's insights for two-sided markets can also be transferred to one-sided markets, as there are special cases where the cross-side network effects are zero and the analysis focuses just on one equation. Even for this special case, our analysis recommends distinguishing between influx and outflow.

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Estimating Network Effects in Two-Sided Markets.
Conditionally accepted for publication in: Journal of Management Information Systems.

Research Report

Investor Attention and Algorithmic Decision Making in Financial Markets

ALGORITHMIC DECISION MAKING PLAYS AN IMPORTANT ROLE IN FINANCIAL MARKETS. ONE SOURCE OF INFORMATION FOR SUCH ALGORITHMS IS THE SENTIMENT OF SOCIAL MEDIA MESSAGES AND NEWS ARTICLES CONCERNING A LISTED COMPANY. YET, CURRENT TOOLS DO NOT DISTINGUISH BETWEEN POPULAR AND LESS POPULAR NEWS AND IT IS UNCLEAR WHETHER METHODOLOGIES BASED ON DATA ANALYTICS CAN BE APPLIED ON SMALL DATASETS OF LESS POPULAR COMPANIES. THEREFORE, WE ANALYZE WHETHER THE IMPACT OF MEDIA SENTIMENT ON FINANCIAL MARKETS IS INFLUENCED BY TWO LEVELS OF INVESTOR ATTENTION AND WHETHER THIS IMPACTS ALGORITHMIC DECISION MAKING.

Benjamin Clapham

Michael Siering

Peter Gomber

Introduction

Due to the massive data volumes generated in today's high-frequent financial markets, algorithmic decision making and decision support systems (DSS) have become indispensable in this business domain. Market participants process new information within very short periods of time and immediately trade on this information. For that purpose, investors and traders employ tools to automatically analyze comprehensive data sources to reach favorable investment decisions.

In particular, the sentiment expressed within financial news and within social media, such as Twitter, has been investigated concerning its relationship to capital market reactions and, consequently, concerning its applicability as an input variable for financial decision support systems (Tetlock, 2007; Bollen et al., 2011). However, one prerequisite for the impact of sentiment expressed in any type of message is that the communicated message itself has to be noticed by a large enough number of market participants, i.e., investor attention is required (Barber and Odean, 2008).

Investor attention is caused by two reasons:

First, sentiment can be expressed within a popular news item, which is shared and commented intensively in social media and referred to by various traditional websites. Second, the respective message or news item can relate to a large, well-known company that is targeted by a larger number of analysts, investors, and traders.

Previous studies proposing DSS have mainly analyzed blue chip companies or media sentiment regarding news items for larger companies (e.g., Schumaker and Chen, 2009). Therefore, until now, it is unknown whether related methodologies as well as the derived trading strategies can also be applied in data settings with fewer observations and less popular news items and companies.

We investigate whether these two levels of investor attention influence the impact of sentiment on financial markets and whether they should be incorporated within algorithmic trading strategies. Furthermore, we investigate whether our proposed algorithmic trading strategies outperform a baseline strategy and, consequently, whether a respective DSS can also be applied in case of smaller companies with lower media coverage and less investor attention.

Research Model

We hypothesize, test, and confirm that sentiment information based on social and traditional online media has an impact on stock returns as several academic studies have already shown (Bollen et al., 2011). Moreover,

research on investor attention suggests that investors mainly react to prominent news and that they especially trade on important information. Previous studies on media sentiment have not accounted for this. Therefore, we enrich the sentiment score of a social media message or news item with its popularity score.

The popularity of a news item is based on the number of reactions that it generates. It approximates investor attention since a higher number of user interactions in social media and more references on other websites increase the reach of the sentiment conveyed by a message. Consequently, more investors are aware of that particular news item and may trade on its sentiment leading to a stock market reaction. Therefore, we hypothesize that investor attention measured by news popularity has a moderating effect on the influence of news sentiment on stock returns, which holds for both social media (*H1a*) and traditional online media (*H1b*). This means that the sentiment of messages and news which are highly popular, i.e., are shared and commented intensively and, thus, achieve high investor attention, has a stronger impact on stock returns than sentiment expressed in less popular and, thus, less relevant news items.

Moreover, larger corporations tend to be better known to investors and financial analysts publish more news articles related to these companies than articles related to smaller firms. Drawing again on investor attention

theory, sentiment information related to small firms, which are accompanied by lower media coverage and, thus, tend to be less known to a broader investor audience, should have a lower impact on stock returns than the sentiment of messages and news concerning large firms. Consequently, we hypothesize that investor attention on a corporate level has a moderating effect on the impact of social (*H2a*) and traditional online media (*H2b*) sentiment on stock returns, and should, thus, be taken into account in DSS design (see Figure 1).

Additionally, we perform a trading simulation and test trading strategies considering sentiment and investor attention against a simple buy-and-hold strategy. Since we propose that investor attention regarding company-related traditional online news and social media

messages moderates the impact of sentiment on stock market reactions, automated investment decisions based on sentiment and news popularity information should outperform trading strategies that only trade on sentiment information. Specifically, strategies following both variables should only trade on relevant information, thereby, leading to higher returns compared to basic sentiment strategies.

Empirical Results

Our analysis (Clapham et al., 2019) is based on 58,517 company-related messages in total (online financial news and social media messages from Twitter and Facebook) as well as stock market parameters gathered from July 1st, 2014, to June 30th, 2015, for 40 listed German companies. These companies are randomly selected from different size

categories according to market capitalization in order to cover companies with differing popularity.

For the whole sample, social and traditional online media sentiment as well as the corresponding news popularity representing investor attention can be used to explain abnormal daily returns. Thus, they should not be neglected within algorithmic decision-making strategies. Specifically, the interaction term of sentiment and news popularity, which accounts for the moderating effect of news popularity, is significant for the whole sample. The sentiment variable alone, however, is not significant. Therefore, hypotheses *H1a* and *H1b* are confirmed as this effect prevails both for social media messages and news items on traditional news websites.

To investigate whether the results also prevail for companies with low investor attention, we repeat the analysis on the subsets of the largest and smallest ten companies in our sample as measured by market capitalization. For large companies, sentiment expressed in popular messages and news items in social as well as traditional online media is significantly related to abnormal stock returns. In case of small companies, however, the interaction term of sentiment and popularity is only significant for social media and not for traditional news websites.

Therefore, algorithmic decision-making based on sentiment and investor attention measured by news popularity needs a careful

configuration to the respective context as the variables to be taken into account depend on the size of a company and the accompanying media coverage. Consequently, low investor attention on a corporate level leads to a lower impact of social and traditional online media sentiment on stock returns, which supports hypotheses *H2a* and *H2b*.

DSS Configuration and Trading Simulation

In order to assess the economic relevance of considering investor attention measured by news popularity for algorithms that trade on media sentiment, we propose a DSS configuration. We apply a trading simulation to evaluate the developed prototype incorporating media sentiment and popularity information. We develop three different trading strategies, test them against a simple buy-and-hold strategy, and vary the critical thresholds of sentiment and popularity that trigger actual investment decisions in a sensitivity analysis.

The three trading strategies are defined as follows: In the *basic news trading strategy*, investment decisions are based solely on sentiment information. The two *advanced news trading strategies* also consider the change in investor attention, i.e., the change in popularity regarding the news about a specific company on a given day. Strategy *advanced news trading I* considers news popularity for opening a position whereas the *advanced news trading II* strategy applies popularity thresholds besides sentiment information for both opening and closing a position.
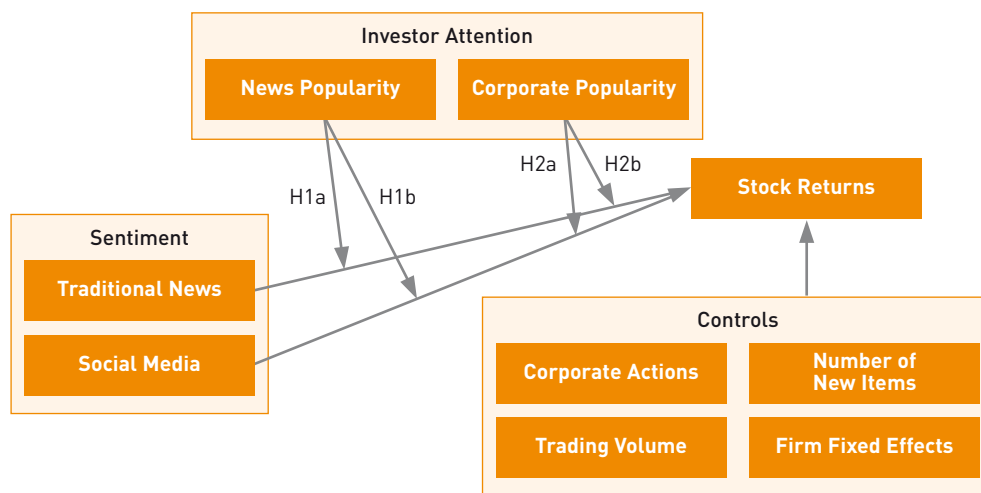

Figure 1: Research Model: Impact of Sentiment and Investor Attention on Stock Returns

Trading Strategy	Return (in %) (improvement to buy-and-hold)	Holding Period (in days)	Transactions (thereof short)
Buy-and-Hold	-1.23 (n.a.)	251	40 (0)
Basic News Trading	-0.19 (1.04)	1.2	485 (145)
Advanced News Trading I	1.14 (2.37)	1.2	215 (71)
Advanced News Trading II	4.12 (5.35)	6.0	186 (62)

Table 1: Results of the Trading Simulation

Our results show that all three news trading strategies based on media sentiment outperform the simple buy-and-hold strategy (see Table 1). Moreover, the *advanced news trading* strategies, which also consider news popularity besides sentiment information and, thus, account for investor attention, achieve higher abnormal returns than the *basic news trading* strategy. Particularly the advanced news trading II strategy, which considers news popularity for both opening and closing a position, achieves the highest return. Consequently, considering both sentiment and popularity for DSS trading on news and social media messages is economically valuable. This result also holds when varying the critical thresholds of sentiment and popularity for buying or selling a stock.

However, when differentiating between large and small companies, the positive results of our trading strategies based on sentiment and popularity are less distinct. While the strategies lead to high abnormal daily returns in case of small companies, relying on daily returns is not fast enough in case of large, well-known companies. When trading these companies, algorithms have to react considerably faster, i.e., during the trading day, to generate abnormal returns based on media sentiment. For smaller companies with lower investor attention, investors can benefit from day-to-day decisions drawing on media sentiment and news popularity as shown with our proposed DSS.

Conclusion

DSS are subject to intensive investigations in finance and information systems research and play an important role in today's financial markets. Many studies have shown that the sentiment of news articles and social media messages influences the stock prices of companies mentioned in these posts. Moreover, algorithmic trading engines already make use of this information to improve their trading decisions. Yet, the impact of investor attention on the influence of media sentiment on stock returns remains unclear.

Our study shows that configurations of trading algorithms should account for both the popularity of news items and the popularity of the respective companies to control for investor attention. Specifically, advanced news trading strategies that determine investment decisions based on sentiment and investor attention measured by news popularity generate significantly higher returns than benchmark strategies.

We show that investor attention has an influence on the impact of sentiment on financial markets on two levels: First, we find that, at a news item level, the impact of sentiment on stock returns is stronger for popular news items, i.e., news with high investor attention.

Second, at a corporate level, the impact of sentiment in case of larger companies with high investor attention is stronger. Nevertheless, our trading simulation – that analyses daily returns – also shows that this impact can be rather exploited in case of smaller companies as a comparably lower number of investors targets these companies so that stock prices react slower to news announcements.

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Insideview

Why Getting Started with Data Science Is Scary, and a Necessity

INTERVIEW WITH KIM NILSSON

Dr. Kim Nilsson
CEO and Founder
Pivigo

Data science receives much attention these days and a lot of companies try to get off the ground in this respect. Would you say companies are struggling with getting started with doing data projects? After all the hype, is it not obvious that any company not doing data science projects will fall behind?

Yes, even though the market has moved in the seven years I have been active in this industry, many companies still hold back from investing in data science and AI. There can be many "fear factors" but they include unclear returns on investment, uncertainty around how to set up projects, hire talent, manage projects, and fear of accidentally going against regulations such as GDPR. I just wish more companies would add "fear of missing out" on that list, as they are certainly missing out on the value in their company data.

Why should companies care and why is it so important to do data science projects?

Since I have been working with companies on data projects, great progress has been made. It is much more common for companies to increasingly add analytics to their operations, making them more competitive. In parallel, startups are appearing in all industries with brand new business models and with data and AI built in from the start. All of this means that soon companies who are not making use of data will be left behind and will lose out. Instead, even small "proof-of-concept" projects – with minimal investment – can deliver significant revenue increases and cost savings today.

What are the greatest challenges, then, to getting started?

There are in general three key challenges: access to data, access to talent, and knowing where to start. Most companies have troves of data in their organization, so most often the data challenge lies in identifying what you have, where it is, and how the data is connected. Once you have data, you may need help under-

standing what a good use case looks like, where the overlap is between the company's priorities, and what the data allows, and what is easy versus hard to do. Here, a consultant can help. Finally, the question around talent: Do you hire, outsource, or take on consultants? Either option has pros and cons, and requires consideration.

What is your key piece of advice for the companies that want to run their first data science projects?

Do not overthink or overcomplicate it! With relatively little effort it is always possible to find a small project to get started with. By delivering a proof-of-concept project, and demonstrating the value in doing data science, you unlock further motivation and investment towards data science efforts. Then, continue to work in an agile fashion, dividing larger projects into work packages that can be delivered over a few weeks, review, learn, and iterate. Also, do not forget to include all the various stakeholders

in the project. This way you can keep everyone on board and excited about the progress, and prevent road blocks down the line.

How, ultimately, do you think data science and AI will change society?

Through our 200 projects with Pivigo, we have seen incredible improvements in profitability and customer satisfaction within our clients' business, and I think a future where the Internet-of-Things combines with algorithms to support our daily lives will be a very exciting one to live in. That said, some of the most impressive use cases lie in improving people's lives, e.g., in healthcare or social applications. For example, we supported the Brain Tumour Charity in understanding their patients' needs better, and re-organizing their services to better support them. Data science projects for greater social good are some of the most rewarding ones to work on.

Thank you for this interesting conversation.

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News

Launch of Our New Website
We proudly announce the official launch of our new website. The website offers quick and easy access to essential information on the efl – the Data Science Institute: events, research areas, publications, teaching, and press releases. Visit us on www.eflab.de.

New efl Industry Partners
We are pleased to announce that as of January 2020, American Express and Deutsche Leasing join the efl – the Data Science Institute as new industry partners. American Express provides multinational financial services and is well known for its card and non-card services. American Express was founded in 1850 and is head-quartered in New York, US. Deutsche Leasing was founded in 1962 and is now Germany's largest manufacturer-independent leasing company. Deutsche Leasing provides leasing services, e.g., for vehicles, machines, IT, or real estate, and is head-quartered in Bad Homburg vor der Höhe, Germany. Welcome to the efl!

Five Research Projects Supported by the efl in 2020
In 2020, the efl will support five interesting and ambitious research projects in the area of data science. The research projects deal with important topics around algorithmic discrimination, intelligent security agents, regulatory impact analysis, decision support systems for aggregating analyst estimations, and the impact of mobile payment on consumption and savings behavior.

Two Successful Disputations
Dominique Marcel Lammer has received his doctoral degree on October 14th, 2019, with his dissertation on "Essays in Household Finance". The dissertation was supervised by Prof. Hackethal. Benjamin Clapham has received his doctoral degree on November 11th, 2019, with his dissertation on "Integrity and Efficiency of Electronic Securities Markets". The dissertation was supervised by Prof. Gomber. Congratulations!

New Colleague
Micha Bender joins the Chair of Prof. Gomber and the efl as a doctoral student in January 2020. He holds a Master's Degree in Business Administration with a specialization in Finance from Goethe University Frankfurt. In his master's thesis, he theoretically and empirically analyzed risks in the context of financial markets.

New Data Science Courses
This semester, the efl offered for the first time its new data science courses as supplementary courses for students of the efl partner universities (Goethe University Frankfurt and TU Darmstadt). The goal of the courses is to use the expertise of the efl in data science to equip students with practical programming and data science skills in addition to the universities' curriculums. Two courses were offered: "Introduction to Python for Data Science" and "Introduction to Data Science". The great interest of the students was already evident during the registration so that within four days both courses were fully booked. The response of the course participants was very positive. Many welcome this additional offer and are highly interested in participating in future courses.

Selected efl Publications

Berg, L.; Ziegler, T.; Binnig, C.; Röhm, U.:
ProgressiveDB – Progressive Data Analytics as a Middleware.
In: Proceedings of the VLDB Endowment, 12 (2019) 12, pp. 1814–1817.

Clapham, B.; Siering, M.; Gomber, P.:
Popular News Are Relevant News! How Investor Attention Affects Algorithmic Decision-Making and Decision Support in Financial Markets.
Forthcoming in: Information Systems Frontiers.

Hinz, O.; Otter, T.; Skiera, B.:
Estimating Network Effects in Two-Sided Markets.
Conditionally accepted for publication in: Journal of Management Information Systems.

Salama, A.; Linke, A.; Rocha, I. P.; Binnig, C.:
XAI: A Middleware for Scalable AI.
In: 8th International Conference on Data Science, Technology and Applications (DATA); Prague, Czech Republic, 2019.

Siering, M.; Janze, C.:
Information Processing on Online Review Platforms.
In: Journal of Management Information Systems, 36 (2019) 4, pp. 1347–1377.

For a comprehensive list of all efl publications see *http://www.eflab.de/publications*

SPRING CONFERENCE 2020

The efl cordially invites to its Annual Spring Conference. The event will be held on February 18th, 2020, at Campus Westend of Goethe University Frankfurt and is organized by Prof. Hinz and his team. The conference will commence at 4 pm. Participants have the chance to discuss the topic "Value of data in business, research and society" with speakers from science and practice. Among our distinguished speakers are Christoph Bornschein (TLGG & Supervisory Board Member of Deutsche Bank), Gordon Burtch (Associate Professor of Information and Decision Sciences at the University of Minnesota), Frank Steffen (Managing Director and Founder of CapTec Partners).

You will find further information on our website: **www.eflab.de**.
Here, you will also be able to register for the event. As always, the participation is free of charge.

Infopool

RESEARCH PAPER: THE PROMISES AND PITFALLS OF ROBO-ADVISING

Robo-advisors offer automated and low-cost investment advice and asset management services. During recent years, robo-advisors have seen a tremendous growth in assets under management. There is, however, little empirical evidence on how robo-advisors affect investor behavior, in particular, portfolio choice and trading behavior. This study shows that investors adopting robo-advising experience diversification benefits. Investors who hold undiversified portfolios before the adoption of the robo-advisor increase stock holdings and end up with less volatile portfolios that achieve higher returns after adoption. Portfolios of previously more diversified investors contain fewer stocks and are less volatile after adoption. The authors also find that investors exhibit prominent behavioral biases, including the disposition, trend chasing, and rank effect to a lesser extent after using the robo-advisor. These results emphasize the promises and pitfalls of robo-advising tools, which are becoming ubiquitous all over the world.

D'Acunto, F.; Prabhala, N.; Rossi, A. G.
In: The Review of Financial Studies, 32 (2019) 5, pp. 1983–2020.

RESEARCH PAPER: TRANSPARENCY, FAIRNESS, DATA PROTECTION, NEUTRALITY: DATA MANAGEMENT CHALLENGES IN THE FACE OF NEW REGULATION

The data revolution continues to transform every sector of science, industry, and government. Due to the incredible impact of data-driven technology on society, we are becoming increasingly aware of the imperative to use data and algorithms responsibly – in accordance with laws and ethical norms. In this article, the authors discuss three recent regulatory frameworks, which aim to protect the rights of individuals who are impacted by data collection and analysis. These frameworks are prominent examples of a global trend: Governments are starting to recognize the need to regulate data-driven algorithmic technology. The main takeaway of this article is that legal and ethical norms cannot be incorporated into data-driven systems as an afterthought. Rather, we must think in terms of responsibility by design, viewing it as a systems requirement.

Abiteboul, S.; Stoyanovich, J.
In: ACM Journal of Data and Information Quality, 11 (2019) 3, Article 15, pp. 1–97.

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